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Do Symptoms And Physical Examination Findings Predict Elbow Pain And Functional Outcomes In A Working Population?

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To the Editor,

Epicondylitis (medial and lateral) is one of the most common disorders among active workers,[1,2] prompting recommendations for surveillance [3,4] or post-offer pre-placement examinations.[5] However, little is known about the value of symptoms and physical examination findings for epicondylitis in predicting future elbow pain, epicondylitis, and job impairment. In a large cohort of newly employed workers, we measured symptoms and physical examination findings of epicondylitis at the time of initial employment and examined the predictive value of these findings for elbow pain, epicondylitis, and work impairment three years later.

We recruited 1107 newly employed workers in several industries in St. Louis, USA between July 2004 and October 2006. [6,7] Subjects completed a symptom questionnaire (elbow and forearm symptoms occurring more than 3 times or lasting more than one week in the last year) and received a physical examination (PE) at baseline. The PE was considered positive if the subject reported pain or discomfort in either arm when the examiner palpated the medial or lateral epicondyles, muscle insertions, and surrounding musculature, or if the subject reported any pain or discomfort in the elbow when the examiner applied resistance against extension or flexion at the wrist (resistance was applied mid-dorsally to the subject's

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hand with the elbow in 90° of flexion). Examiners were trained in the use of a structured PE protocol.

Subjects' baseline status was classified in four categories: 1) subjects with no elbow symptoms and negative (normal) PE; 2) subjects without elbow symptoms, but with a positive (abnormal) PE; 3) subjects with elbow symptoms and negative PE; and 4) subjects meeting our epicondylitis case definition of elbow symptoms and positive PE occurring in the same arm. We conducted follow-up questionnaires and performed PE 3 years after baseline measures using similar protocols. At follow-up we defined "severe" elbow pain as elbow pain within the past 30 days with a rating of 5 or higher on a scale of 0 (no discomfort) to 10 (worst discomfort imaginable). Job impairment was assessed using a composite outcome [6] that included any worker who reported a limitation attributed to elbow symptoms in any one of the following areas: 1) limited ability to work, 2) decreased productivity, 3) lost time from work, 4) placed on job restrictions, and 5) change in job or employer because of symptoms. Analysis compared baseline subject categorization to three outcomes at follow-up: epicondylitis, severe elbow pain, and job impairment. Comparisons used non-ordinal multinomial logistic regression models (for outcomes with more than 2 categories) and simple logistic regression models for the outcomes of job impairment and severe elbow pain. We also examined the predictive value of baseline subject categorization for elbow pain, epicondylitis, and work impairment three years later.

The study group included 1107 newly hired workers, 65.1% male, with a mean age of 30.3 years (SD 10.3). Symptom questionnaires and repeated physical examination data were available on 742 subjects. Median follow-up was 34 months, with a range of 26 months to 71 months. There were no differences in baseline classification of elbow outcomes between subjects lost to follow-up and those who were followed. The evolution of symptoms and PE findings by category are summarized in Table 1. Of the subjects with epicondylitis at follow-up, 59.6% (n=34) had no elbow symptoms and positive elbow PE at baseline. The natural history of symptoms was also complex. Across all outcomes, subjects with both elbow symptoms and PE findings (epicondylitis) had the strongest association with future pain ($OR_{\text{severe pain}}$ =7.2[2.8-21.4]), PE findings ($OR_{\text{epicondylitis}}$=10.3[3.4-31.5]), and job impairment ($OR_{\text{job impairment}}$ =7.2[2.4-21.3]). Although PE findings in subjects without pain were associated with future epicondylitis (and with future PE findings), PE alone was not associated with job impairment, whereas pain alone was associated with all outcomes. Positive predictive value of different combinations of symptoms and PE was low for all categories (less than 30%, Table 1). In this relatively healthy worker cohort, negative predictive values were high for all combinations of symptoms and PE.

This study of elbow pain in newly hired workers found that elbow pain and physical findings suggestive of epicondylitis predicted future pain and job impairment, though the predictive value of symptoms and physical findings was low. Limitations of the study include the follow-up intervals, which may have been too widely spaced to detect all cases of elbow pain or epicondylitis. This information is useful for designing surveillance programs for epicondylitis.

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Table 1

Evolution of symptoms and PE findings, and predictive values, according to baseline categories.

		Outcome at follow-up					Predictive values of severe elbow symptoms, clinical examination and job impairment at follow-up according to baseline elbow clinical examination findings					
		No elbow symptoms and PE- (n=525)	No elbow symptoms and PE+ (N=121)	Elbow symptoms + and PE- (N=39)	Elbow symptoms+ and PE+ (i.e., epicondylitis, N=57)	Total (N=742)	Severe elbow symptoms		Epicondylitis		Job impairment	
		n (%)	n (%)	n (%)	n (%)	N (%)	PPV	NPV	PPV	NPV	PPV	NPV
Baseline categorization	**No elbow symptoms and PE+**	35 (6.6)	31 (25.6)	2 (5.1)	10 (17.5)	**78 (10.5)**	0.12	0.93	0.12	0.94	0.07	0.94
	Elbow symptoms+ and PE-	14 (2.6)	4 (3.3)	4 (10.2)	7 (12.2)	**29 (3.9)**	0.21	0.93	0.24	0.94	0.16	0.94
	Elbow symptoms+ and PE+ (i.e., epicondylitis)	8 (1.5)	3 (2.4)	3 (7.6)	6 (10.5)	**20 (2.7)**	0.30	0.93	0.30	0.94	0.25	0.95

PE **physical examination (for epicondylitis);+ positive, - negative;** ***PPV*** **positive predictive value;** ***NPV*** **negative predictive value.**

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